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RESEARCH MEMORANDUM



MEASURING THE EFFECTIVENESS OF ADVERTISING IN A POSITIONING CONTEXT WITH MULTI DIMENSIONAL SCALING TECHNIQUES

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FEW 352

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MEASURING THE EFFECTIVENESS OF ADVERTISING WITH MULTI-
DIMENSIONAL SCALING TECHNIQUES*

1. Introduction

Measuring the effectiveness of advertising is one of the most difficult problems in marketing management. Over the years, however, many measures and models and methods of measurement have been developed. Measurement of recall and recognition is one of the eldest methods. Lucas, Britt (1963) elaborate on these and many other measures and techniques measuring advertising effectiveness. Especially, in the sixties, models describing the 'working of advertising' have been published. Lavidge, Steiner (1961) and Colley (1961) are famous names in the realm of models of advertising effectiveness. Most models and methods however focus on recall or recognition of the brand name, on the brand preference or on advertising effects on sales (Rao (1970)). It was yet in the seventies and eighties that advertising goals which were stated in terms of brand positioning came more into interest (Trout, Ries (1972)).

Trout and Ries argued that because of the tremendous volume of advertising and new brands and products, consumers ran out of their mental ability and brain power. They stressed the importance of the need to position brands

* Parts of this paper have been presented in May 1988 for the University of Cracow (Poland).

in the consumers mind (only in global terms) to assure the brand's position in the evoked set. One of their warnings still is up-to-date: "you can't appeal to everyone".

This paper deals with methods and measurements designed for measuring the effectiveness of an advertising campaign, when (re-)positioning of a particular brand is the campaign's purpose.

As will be presented, the basic idea is the comparison of the brand position on a brand map before and after the campaign.

The structure of the rest of the paper is as follows: First we shortly pay attention to the terms "advertising", "effectiveness" and "multidimensional scaling techniques" by defining them (section 2). In section three we describe some procedures and in section four an explicit measure or index is dealt with. In both sections possibilities and problems are mentioned. Section five deals with some conclusions.

2. Some definitions

First the basic concept "advertising" has to be defined. For our purpose we take the widely accepted definition of Nickels (1976) which follows the American Marketing Association definition: Advertising: "Any paid non-personal communication about the demand for and the supply of persons, places, ideas, goods, services or causes by business, government agencies, non-profit-organisations and individuals who are identified in the message". So even announcements of the Polish government concerning opening hours of tobacconists-shops are included in this description.

The next concept is that of "effectiveness". In general "effectiveness" is seen as "the degree to which stated goals have been reached". It is this point of view that we share in the context of this paper. It is however surprising to see that, despite the existence of this widely accepted simple description of "effectiveness", many articles and papers use "effectiveness" as a measure for 'effect' or productivity. In other words, while "effectiveness" should be a dimensionless figure (e.g. $\frac{8 \text{ (real percentage marketshare increase)}}{10 \text{ (intended percentage marketshare increase)}} = 0.8$), many authors write about an elasticity or turnover-amount being "effectiveness". See Stevers, Versteijne (1987) for a review of marketing literature on the concepts of effectiveness, efficiency and productivity.

Finally, multidimensional scaling techniques -from now on referred to as MDS- is a set of related scaling techniques by which perceptions of consumers about several brands, finally can be displayed graphically in a so called "brand map". For an in-depth review of the working of MDS we refer to Backhaus (1987), Green and Rao (1972) and Green, Tull, Albaum, (1988). Here it is sufficient to remark that MDS has some favourable aspects with respect to gathering data, compared with factoranalysis.

3. Procedures

As indicated before, we are looking for both methods (procedures) and measures to measure the effectiveness of advertising in a (re)positioning context. This section deals with the methods, while section four addresses to the topic of the measure.

Both Dillon, Domzal, Madden (1986) and Lautman, Percy, Kordish (1987) suggested a four-step-method that can be used to select an advantageous advertising theme and for assessing the impact of advertising in a brand positioning context.

The method designed by Lautman et al. consists of the following steps:

1. identifying how consumers differentiate among brands,
2. isolate those criteria which seem to be used most by consumers in differentiating brands,
3. make a quantified assessment of the consumers brands perceptions on the identified dimensions,
4. develop a new copy strategy and expose consumers to several alternative ad executions; assess the brand map positions of the alternative executions.

In step 3, Multidimensional Scaling procedures can be applied to assess the consumers multi-dimensional perceptions.

Dillon, Domzal and Madden suggested also a (slightly different) four-step-method:

1. obtain a brand map,
2. expose consumers to the repositioning campaign,
3. obtain a new brand map, and
4. evaluate the new position of the brand in relation to the 'desired' position, by using some sort of 'index'.

Section 4 will elaborate on these indices.

When we evaluate both methods we can say that the procedures mentioned are in essence very comprehensible and theoretically easy-to-use; the idea is simple. When your goal is to change your brand in the consumer's perception, then just assess a brand map before exposure, expose, and measure after exposure, and in order to make an explicit evaluation, apply some evaluation index on the brand map change.

However, basically simple, these methods suffer from several problems:

1. Stochastic brand map positions; because the brand maps will be generated with the help of a sample of respondents, the (mean) score of a brand on the dimension axes are in fact estimates, subject to estimating errors. In evaluating changes one should take into account a (multinormal) distribution around these means. Tests of significance should be applied.
2. Changes in the position of a brand on a brandmap could also be initialized by other marketinstruments or by contingency variables. E.g. a change in the brand's price could influence the perception of consumers of the quality of the product, which in turn could be reflected in a change in brand map position. The same reasoning applies for actions of competitions or other institutions in the core market system. So, when applying these methods one should assure the absence of other influencing factors. In a pretest situation this will be easier than in a real 'on-air' situation.
3. Which time period to take into account?

This is another traditional problem in the area of testing advertising effectiveness. Should we assess the 'after-exposure-map' one week, one month or one year after exposure?

This problem can easily overcome by stating the advertising goals for a specific moment point in time.

4. Applicability for low-involvement goods?

Low-involvement buying processes typically are not based on extensive problem solving behavior (Engel, Blackwell, Miniard, (1986). One may hypothesize that such processes are based on habit, routinized or automatic processes, in which real brand perceptions do not anymore play a role. So, what's the reason in measuring brand perceptions. In fact for most productcategories, advertising, goals, will not sound in perceptionterms, but in terms of mere brandname or sales.

5. Importance of the relevant dimensions.

Despite stating positioning goals in terms of beliefchanges, one could argue that severe changes in the weights of the criteria dimensions, substantially could influence the perception of or even preference towards the brand.

6. Number of stimuli. MDS typically generates bad or unrealistic solutions for a very low or high number of stimuli (brands). Use of few brands leads to non-unique solutions, while too many brands could badly influence the task of the respondent while filling in his inquiry-form. The 'ideal number of stimuli' is between 8 and 15.

7. Methodology artifact. Applying standard scaling methods before and after exposure will "undoubtedly produce a perceptual space map in which all of the brands have been displaced; that is, given a change in

one's brand position in the perceptual joint space (i.e., the referent brand), the distances among the other brands will most likely have to change in order to maintain a satisfactory goodness-of-fit value" (Dillon, Domzal, Madden (1986, p. 30)). These displacements of the non-referents complicate the assessment of the effectiveness of the campaign. Dillon, Domzal, Madden describe a methodology to cope with this problem. This methodology where configural invariance of the non-referent brands is assumed to hold is called ASCID.

The number of problems that could be mentioned can easily be enlarged by looking at the 'normal' problems which are inherent to application and interpretation of multidimensional scaling techniques (homogeneous perceptions, knowledge of brands etc.). In fact, this remark does apply also to the most common known problems in advertising research.

An important preliminary conclusion thus is, that measuring advertising effectiveness with MDS, suffers from both the common well-known problems in measuring advertising effectiveness and the problems with applying MDS.

4. Measurement

In this section we suppose that already a method à la Dillon et al. or Lautman et al. has been used to assess before- and after-exposure brand map positions.

We now focus on indices that can be used to assess more explicitly and quantitatively advertising effectiveness. With respect to this purpose we examine the measure proposed by Seggev (1982).

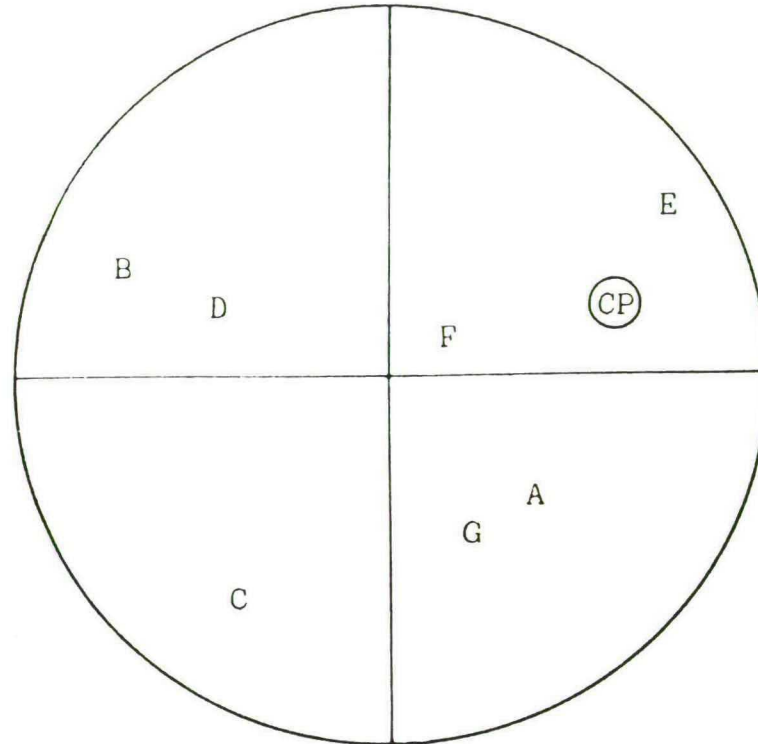
Seggev proposes the following three steps in deriving a measure:

1. Determine the a priori position of the brand in a perceptual map; this is called the 'bench mark position' or current position (CP). See figure 1.
2. Assess a desired position (DP) in this brand map (figure 2);
expose people to a number of alternative advertisements or commercials; then construct a new brand map in which graphically the 'psychological positions' of the brand, resulting from all the different strategies (commercials, ads) are described. Figure 3 shows the results of testing three strategic approaches. However, graphic representations of results do not go far enough. It would be nice to know if e.g. S_2 is 'better' than S_3 , and if so, how much. In order to say more about the relative success of the different strategies Seggev introduced the "Persuasion Index".
3. For every strategy (copy/ad) the following expression is computed

$$PI = \left[1.00 - \frac{\hat{S}_i}{90^\circ} \right] \cdot \left[\frac{\overline{CP S_i}}{R} \cdot 100 \right] \quad (1)$$

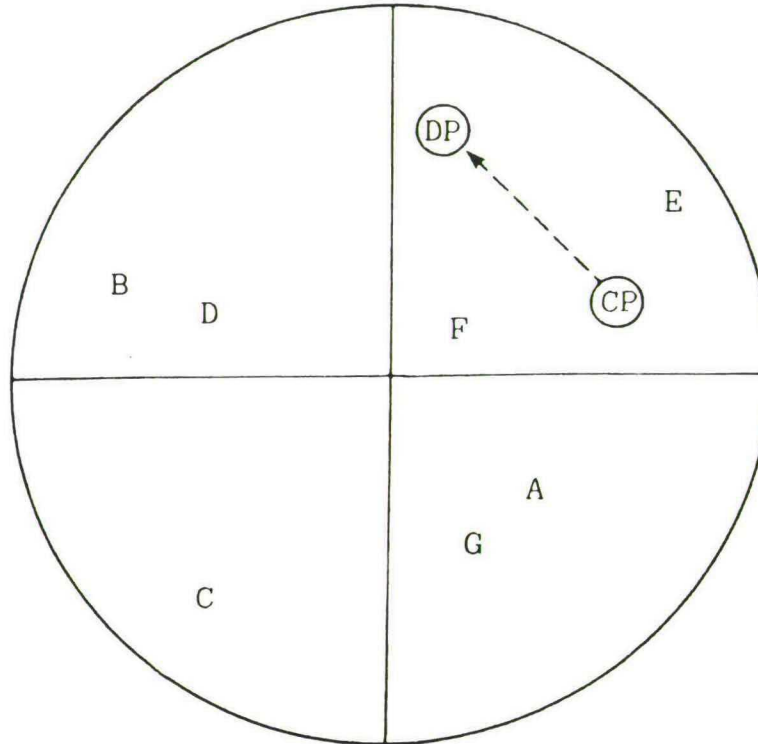
where PI = Persuasion Index; a quantitative expression for the effectiveness of the advertisement.

Figure 1
Bench-Mark Positioning



CP: current positioning
A through G: competitive ads/products

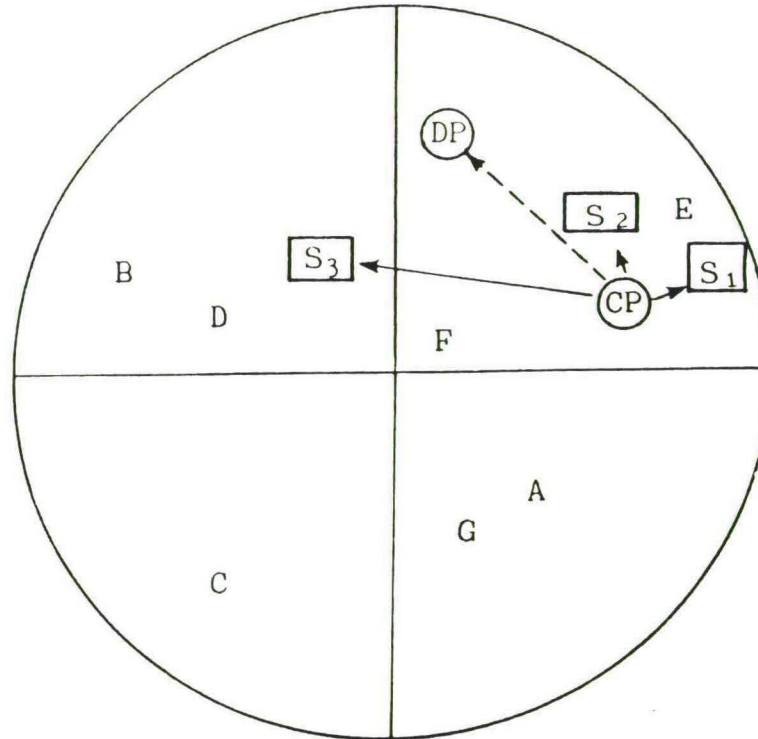
Figure 2
Setting Positioning Objectives



DP: desired positioning
CP: current positioning
A through G: competitive ads/products

Figure 3

Test of 3 Strategies



CP: current positioning
DP: desired positioning

S1, S2, S3. : alternative strategies
A through G: competitive ads/products

\hat{S}_i = the angle formed by the vector $\overline{CP DP}$ and the line extended from CP through S_i .

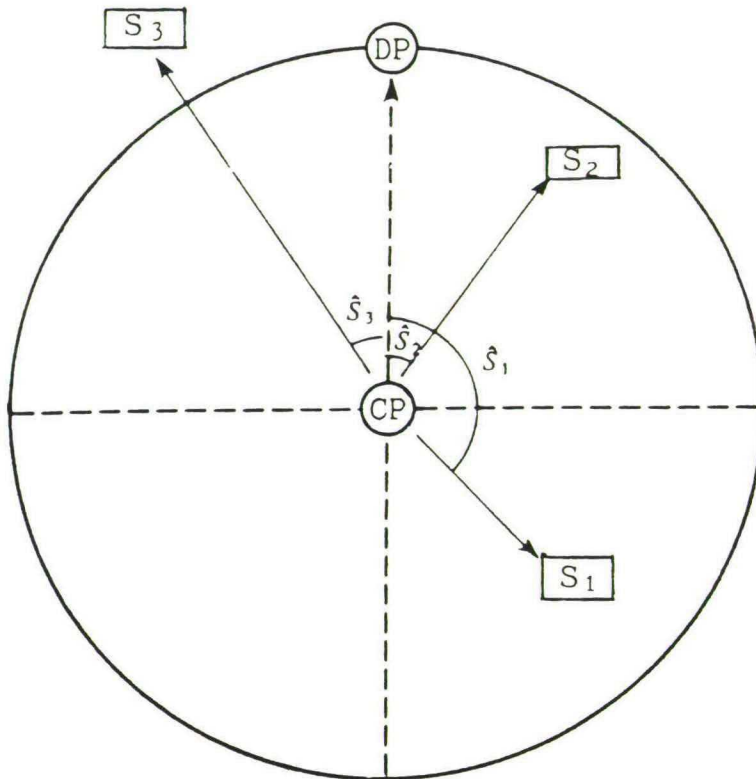
$\overline{CP S_i}$ = the absolute length of the line connecting CP and S_i .

R = the length of the radius of the circle around CP;
in fact, this is the absolute length of the line connecting CP and DP.

See figure 4; In figure 4 the circle is drawn with CP as center. With this formula one can capture in one single numerical expression the degree to which an ad has brought the brand closest to its desired position. As can be seen in equation (1), the effectiveness of alternative strategies (or 1 strategy) can be assessed as a function of two factors; first, the direction to which the ad 'brought' the brand to, and second, the intensity or strength of 'transportation' of the brand from the 'current position' to the new position. So the index Seggev proposes is a "measure of closeness of the tested strategy to the positioning objective as expressed by the relative length of the line from the current positioning to the desired positioning, weighted by the degree to which the strategy matches the direction of the objective relative to the current situation (Seggev (1982), p. 41).

Despite its simplicity and justification to the term 'effectiveness' Seggev's index suffers from some problems.

Figure 4
Derivation of Persuasion Index



CP: current positioning

DP: desired positioning

S_1, S_2, S_3 : alternative strategies

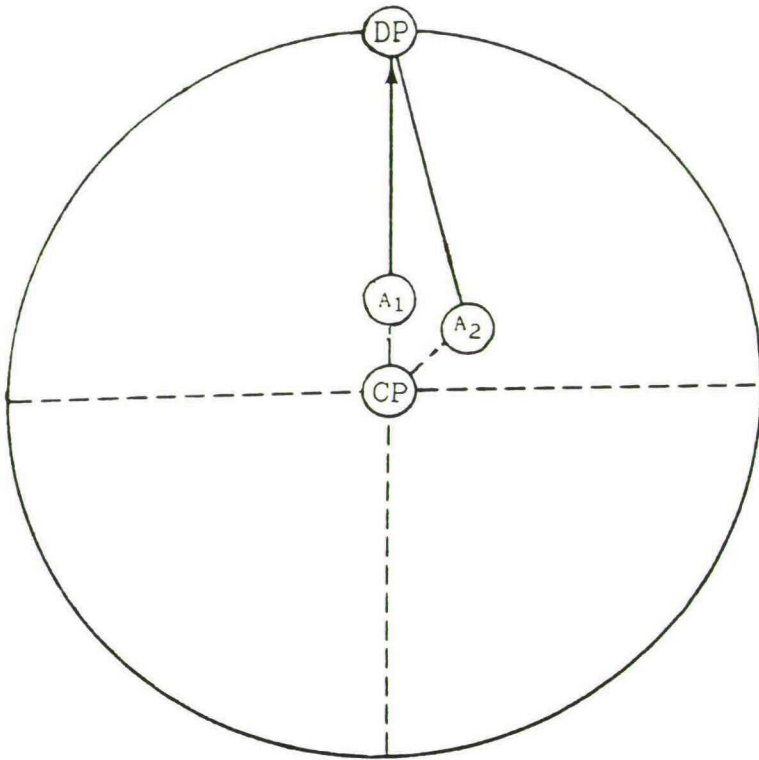
First of all, we can question the metric properties of the PI, and especially the 'direction-factor'. In figure 5 we have a current position CP and a desired position DP, and also we see the effects on the positioning of the brand from two alternative strategies, A_1 and A_2 . The vectors $\overline{CP A_1}$ and $\overline{CP A_2}$ have the same length. The only difference is the direction to which the two strategies 'moved' the brand. \hat{S}_1 for A_1 is 0; $\overline{CP A_1}$ is pointing in the same direction as $\overline{CP DP}$. The angle between $\overline{CP DP}$ and $\overline{CP A_2}$ however is 45° . So, the expression $(1.00 - \frac{\hat{S}_1}{90^\circ})$ for A_1 equals 0 and for A_2 equals 0.5.

If we look at the second factor of the PI, the intension, or distance-factor, we can see that $\overline{DP A_1}$ has almost the same length as $\overline{DP A_2}$. These two factors combined will result in an effectiveness, a PI which for A_1 is more than twice as high as for A_2 . This significantly depends on the difference in direction for both strategies.

However the 'new' distances from A_1 to DP and from A_2 to DP are almost equal. So, with the PI-formula A_1 will be 'punished' too strongly. Therefore, one could argue that comparison of the length of $\overline{A_1 DP}$ to the length of $\overline{CP DP}$ results in a better measure to determine the effectiveness (the degree to which the Desired Position has been reached with an advertisement.) The index of effectiveness in my opinion should measure the relative decrease in distance from the current position to the desired position. In figure 6 we find the basis for this index. CP is the 'current' position (position before exposure); DP stands for desired position, and AP means actual position (the new positioning after the commercial/campaign).

Figure 5

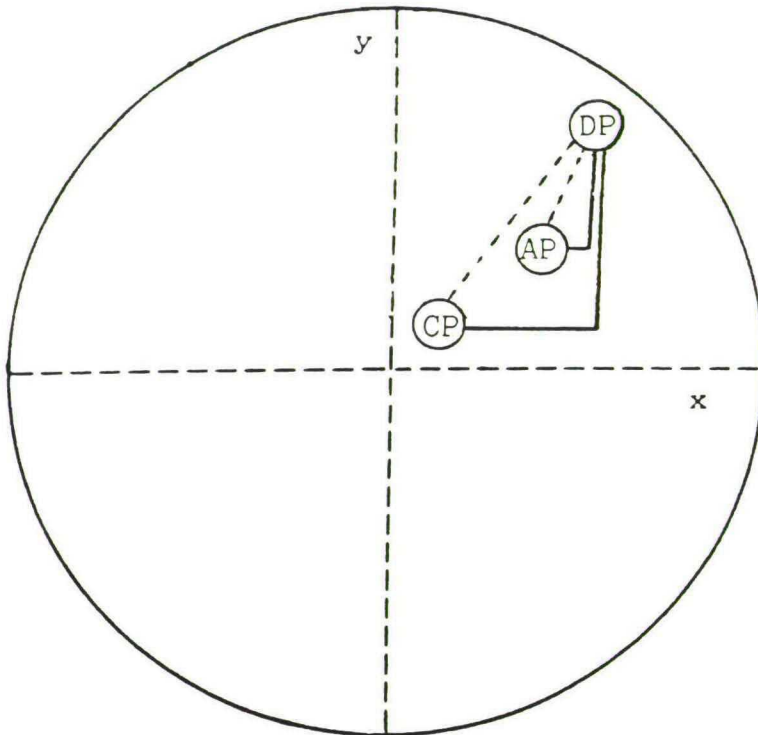
The Effects of 2 Alternatives



A_1, A_2 : 2 alternatives
DP: desired positioning
CP: current positioning

Figure 6

Derivation of the Index of Effectiveness



DP: desired positioning
AP: actual positioning
CP: current positioning

The 'old' distance from CP to DP can be derived via Pythagoras; this Euclidean distance is: $((DP_x - CP_x)^2 + (DP_y - CP_y)^2)^{\frac{1}{2}}$.

The 'new' distance can be derived via:

$$((DP_x - AP_x)^2 + (DP_y - AP_y)^2)^{\frac{1}{2}}.$$

We can the index in this case compute as:

$$100 (1 - ((DP_x - CP_x)^2 + (DP_y - CP_y)^2)^{\frac{1}{2}} / ((DP_x - AP_x)^2 + (DP_y - AP_y)^2)^{\frac{1}{2}}) \quad (2)$$

A general formula for the Index of Effectiveness (IE) then is:

$$IE = 100 \cdot \left[1.00 - \frac{\sum_{i=1}^N (D_i - A_i)^2}{\sum_{i=1}^N (D_i - C_i)^2} \right]^{\frac{1}{2}} \quad (3)$$

where D_i , A_i and C_i are the (quantitative) positions of the desired, actual and current, respectively, position on the i -th dimension. Total number of dimensions is N .

A second comment on Seggev's PI is attached to the fact that the 'perceptual' length of the vector $\overline{CP S_i}$ is based on an 'unweighted' euclidean distance. If dimensions (attributes) are not equal in importance to the consumer, the PI will 'weight' the less important dimension(s) too high.

These weights can be derived from a conjoint measurement analysis or directly from the MDS-program PREFMAP. With respect to this weighting/importance-issue the IE however can easily be adapted:

$$IE^W = 100. \left[1 - \frac{\sum_{i=1}^N w_i \cdot (D_i - A_i)^2}{\sum_{i=1}^N w_i \cdot (D_i - C_i)^2} \right]^{\frac{1}{2}} \quad (4)$$

A third comment concerns the simplicity of the graphical base of the PI. In many instances perceptions of consumers are not two-dimensional; In cases where consumers differentiate among brand by means of 5 attributes Seggev's flat 'pancake' can't be used to assess the total impact of advertising.

His formula however, then still is applicable; the PI is based on computations of directions and lengths of vectors.

The IE-measure which we proposed in this article only uses lengths of vectors. Therefore, because of its applicability we prefer the use of the IE.

The last remark about the PI-index is about the effects of perceptual changes longer or shorter than the desired change. Seggev states: "whether the line CP/S_i extends beyond the radius (i.e., outside the circle), the Persuasion Index should reflect the fact that a given distance, longer or shorter than the length of the radius, is interpreted as the same degree of accomplishment of the objective".

With this respect we agree with Seggev; the IE therefore is based on the distance from the actual position to the desired position, disregarding extension or falling short the objective.

5. Conclusion

Measuring the effectiveness of advertising in the context of positioning can easily be accomplished by MDS-procedures and the Index of Effectiveness (IE). However, many problems have to be eliminated. Most problems arise from the MDS-procedures. All the traditional pitfalls accompanying the use of MDS in general appear in the proposed specific application. Further research should direct to the scaling techniques underlying the brand maps. Some other problems are inherent in measuring advertising effectiveness in general; this are the ones also present in measuring advertising effectiveness when sales or recall-measures are used: "was advertising the only influencing factor?" and "how long do we have to wait till total effect has worked out". Further research in this area should adress to the use of controlled experiments. The presence of cable-t.v. and scanning-mechanisms in the stores will enable improvements in the future.

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